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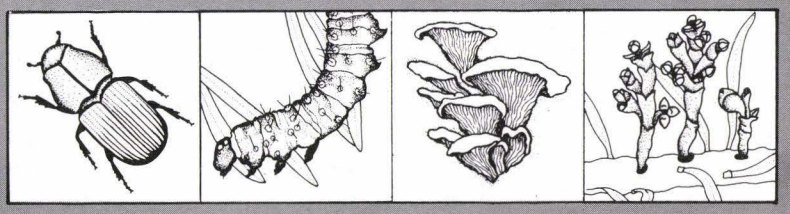

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PERMANENT MOUNTAIN PINE BEETLE POPULATION TREND PLOTS: AN UPDATE, 1983

by

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ABSTRACT

For the fourth year since their establishment, the six permanent plot locations in Montana were revisited following beetle flight in 1982. Beetle populations remained low in five of the six areas. Only in the Murr Creek plots did newly attacked trees represent an epidemic beetle population. In the Centennial Valley location, several plots had been logged. Growth and phloem thickness data were collected from Murr Creek, Boulder Creek, and Dunsire Creek in an effort to explain why beetle numbers are not building in these areas as rapidly as we had anticipated. Insufficient data has been collected, as yet, to reach meaningful conclusions.

INTRODUCTION

Following beetle flight in 1982, we once again visited the six areas in the State containing permanent mountain pine beetle trend plots. These plots, 30 in each of the six areas, were established in July 1979 (Gibson et al. 1980). In 1979, and each year since, the plots have been monitored after beetle flight (Gibson 1981, 1982). Plots were originally established in areas of lodgepole pine which were then uninfested, or with low populations, but which we considered to be high risk for beetle infestation--based on criteria described by Amman et al. (1977). Our intent is to follow the course of the infestation over stands of known preoutbreak characteristics. We expect that impact data collected from the beginning to the end of the infestation will enhance management recommendations for lodgepole pine stands threatened by mountain pine beetle. While beetle populations have not yet developed in some areas to the extent we anticipated, any information regarding the failure of stands to support beetle outbreaks will be valuable. Such information may assist us in our attempts to refine risk rating systems.

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RESULTS AND DISCUSSION

To date, beetle populations still are not developing in some areas as we expected (based on the risk-rating criteria we used). In other areas, the infestation has apparently peaked and is beginning to wane. Most notable of those areas is Centennial Valley, where trees per acre attacked have steadily declined since 1979. In 1982, no new attacks were observed there. In addition, four of the previously heavily attacked plots were logged sometime before our evaluation in 1982. Data compiled from the 30 plots in that area (tables 1 and 2) indicate the beetle did have a decimating effect on those lodgepole pine stands. Though only 31 percent of the trees over 5 inches d.b.h. were killed, those trees represented 85 percent of the volume. That explains, at least in part, the decline of the infestation since its peak in 1979. Slightly more than 150 green trees per acre over 5 inches d.b.h. remain; however, they are in the smaller diameter classes and represent only 314 board feet volume per acre. Beetle populations are expected to remain endemic in those stands for the next several years.

The Madison River plots have also shown a consistent decline in new attacks for the past 4 years--having peaked in 1978. Though only 18 percent of the lodgepole pine greater than 5 inches d.b.h. was killed, those few trees represented 60 percent of the lodgepole volume in the stands. No new attacks were observed in those plots in 1982 and, as in the Centennial Valley plots, those green trees remaining are of sufficiently small diameters (mostly 5-8 inches d.b.h.) that adequate food supplies for sustained beetle populations may no longer exist.

The data collected from the Murr Creek/North Fork Murr Creek plots indicate that while numbers of newly attacked trees have remained fairly constant for the past 3 years, many susceptible trees remain. All of the characteristics we usually associate with high risk for mountain pine beetle attack in lodgepole pine are present in most of these stands: age is about 100 years, average diameter approximately 11 inches, and elevation-latitude (4,400 feet; 48° N) factor is in the high-risk range. Some factor or set of factors must be keeping beetle populations relatively low in these stands. It could be that the beetles are just taking an abnormally long time to build up. Amman (1982) has stated that epidemics in a given stand usually last 5 to 7 years. Last year, 1982, was the sixth consecutive year we have measured annual mortality above what is usually considered epidemic conditions ($\geq$ 1 tree per acre). Some infestations have been known to persist for years in a low epidemic/high endemic condition (W. E. Cole, pers. comm.). Such long-standing infestations are largely unexplained.

Table 1.--Permanent mountain pine beetle trend plots in Montana--1977 through 1981. Mountain pine beetle-caused mortality in lodgepole pine.

Area		1981 attack	1980 attack	1979 attack	1978 attack	1977 attack	Older dead	Total MPH dead	Other bark beetle mortality (total)	Unknown mortality (total)	Total standing standing dead	Percent MPB MPB caused
Centennial Valley	TA[1]	5.5	8.9	47.8	13.5	9.9	4.2	89.8	28.4	4.5	122.7	73
	BFA[2]	41.1	44.9	1057.7	446.4	549.8	114.8	2254.7	68.2	-	2322.9	97
Madison River	TA	4.2	5.6	8.8	14.9	4.2	3.8	41.5	38.4	14.5	94.4	44
	BFA	361.2	360.1	497.3	703.8	285.1	38.3	2245.8	86.9	60.4	2393.1	94
Murr Cr.	TA	7.3	9.6	3.6	4.2	2.6	2.8	30.1	11.1	12.2	53.4	56
	BFA	267.7	112.3	45.9	88.0	47.2	113.2	674.3	-	150.2	824.5	82
Boulder Creek	TA	0.0	0.0	0.8	0.0	0.0	0.0	0.8	3.7	19.6	24.1	3
	BFA	0.0	0.0	-	0.0	0.0	0.0	0.0	-	48.5	48.5	0
Dunsire Creek	TA	0.0	0.5	0.0	0.6	0.0	0.0	1.1	3.4	32.5	37.0	3
	BFA	0.0	53.2	0.0	121.8	0.0	0.0	175.0	176.9	418.7	770.6	23
Spotted Bear	TA	1.2	0.7	0.0	1.0	0.3	1.9	4.3	5.9	38.3	48.5	9
	BFA	-	46.2	0.0	102.1	59.4	106.6	314.3	102.8	236.5	653.6	48

1/ TA = Trees per acre.

2/ BFA = Board foot volume per acre.

Table 2.--Permanent mountain pine beetle trend plots in Montana--following beetle flight, 1982. Mountain pine beetle-caused mortality in lodgepole pine.

Area		1982 attack	1982 strip	1982 pitchout	Total MPB mortality (to date)	Other bark beetle mortality (1982)	Unknown mortality (cum)	Total standing dead [1/] (to date)	% MPB caused	% Original green stand killed by MPB (to date)	Remaining green LPP (≥ 5")
Centennial Valley	TA	0.0	1.3	1.9	89.8	9.0	11.5	138.7	65	31	150.7
	BFA	0.0	42.3	-	2254.7	-	-	2322.9	97	85	314.4
Madison River	TA	0.0	0.5	1.4	41.5	0.35	12.1 [2/]	92.3	45	18	143.3
	BFA	0.0	20.70	120.0	2245.8	40.7	-	2373.4	95	60	1384.8
Murr Creek	TA	7.1	0.7	5.35	37.2	3.3	12.1 [2/]	63.7	58	11	283.7
	BFA	631.5	48.8	157.2	1035.8	57.3	150.2	1243.3	83	18	4361.7
Boulder Cr.	TA	0.0	0.5	0.3	0.8	0.0	19.7	24.2	3	<1	265.6
	BFA	0.0	48.5	58.0	0.0	0.0	135.5	135.5	0	<1	4347.0
Dunsire Cr.	TA	0.0	1.1	1.3	1.1	0.7	28.4 [2/]	32.8	3	1	161.1
	BFA	0.0	119.9	94.8	175.0	118.7	479.8	832.4	21	2	7780.3
Spotted Bear	TA	0.5	0.0	0.0	4.8	9.9	35.1 [2/]	45.8	10	2	225.3
	BFA	51.3	0.0	0.0	365.6	0.0	237.3	705.7	52	4	7724.1

1/ "Total standing dead" is totalled MPB, Other, and Unknown mortality, still standing, for all years.

2/ Figures for "cumulative unknown mortality" are less in 1982 than in 1981 reflecting dead trees cut or fallen in the past year.

Explaining the low infestation level in the final three plot areas is even more difficult. In all three areas--Boulder Creek, Dunsire Creek, and Spotted Bear--the infestations have been at endemic levels or below for most of the past 4 years. No new attacks were observed in either the Boulder Creek or Dunsire Creek plots in 1982. In the 30 plots at Spotted Bear, two new attacks were recorded--one on each of two plots. Risk-rating criteria described by Amman et al. (1977) identify Spotted Bear and Dunsire Creek as high risk for beetle attack and Boulder Creek as moderate:

Area	Average d.b.h. LPP [1] >5 inches	Avg. age	Elevation/latitude
Spotted Bear	8.5 inches [1]	100	4,000'/47° 50'
Dunsire Creek	9.3 inches [1]	120	4,400'/48° 20'
Boulder Creek	7.8 inches [1]	115	4,800'/48° 50'

1/ These are average diameters for all lodgepole over 5 inches in the 30 plots. Many trees, and all those for which growth and phloem thickness were measured, vary from 10 to 12 inches d.b.h.

It may be that beetle populations are still building in those areas, and the trees may yet be attacked. Infestations have existed, however, in areas near those stands for several years. Thus, it seems that stand characteristics other than those normally associated with "high risk" are influencing these stands' susceptibility to the beetle.

In 1982, I began collecting growth rate and phloem thickness data in these areas--from both infested and uninfested trees--in an effort to determine if these factors may be contributing to the low beetle populations found there. As yet, insufficient data have been collected to reach meaningful conclusions. I plan to continue collecting that information in 1983.

When we established these permanent plots, our intent was to gather impact data through the course of an infestation. Infestations of epidemic proportions have not yet developed in three of the six areas. If those stands remain uninfested, or if infestations take an abnormally long time to build there, and we are able to identify the stand characteristics responsible, we may be able to refine our risk-rating systems. That informtion, too, will be of great importance to the land manager.

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